

Figure 5-1. Caltrans Orders of Survey Accuracy

CALTRANS ORDER (Note 1)	STANDARDS			MONUMENT SPACING AND SURVEY METHODS (Note 2)			APPLICATION – TYPICAL SURVEYS	
	CLASSICAL		POSITIONAL	MONUMENT SPACING (MINIMUM)	TYPICAL SURVEY METHOD			
	HORIZONTAL (Note 4)	VERTICAL (Note 5)			HORIZONTAL	VERTICAL	HORIZONTAL	VERTICAL
B (Note 3)	1:1,000,000	Not Applicable	Per NGS Specifications	10 k	GPS: Static	Not Applicable	High Precision Geodetic Network (HPGN)	Not Applicable
First (Note 3)	1:100,000 (Note 10)	e = 5√E	Per NGS Specifications	3 k	GPS: Static Fast Static	Bar Code	Basic (Corridor) Control – HPGN-D Project Control – Horizontal (perferred, when feasible)	Rarely used. Crustal Motion Surveys, etc.
Second	1:20,000	e = 8√E	(Note 8)	500 m	GPS: Static Fast Static TSSS: Net Traverse	Bar Code 3-Wire TSSS: Trig	Project Control – Horizontal (see First Order also)	Basic (Corridor) Control HPGN and HPGN-D Project Control
Third	1:10,000	e = 12√E	(Note 8)	As Required	GPS: Static Fast Static Kinematic RTK (Note 13) TSSS: Net Traverse Resection Double Tie (Note 9)	Bar Code Single Wire TSSS: Trig GPS: Static (Note 7) RTK (Note 11)	Supplemental Control > Engineering > Construction • Interchange • Major Structure Photo. Control – Horizontal Right of Way Surveys Construction Surveys (Note 6) Topographic Surveys (Note 6) Major Structure Points (Staked)	Project Control – Vertical Supplemental Control Photo. Control – Vertical Construction Surveys (Note 6) Topographic Surveys (Note 6) Major Structure Points (Staked)
G (General)	As required, see appropriate survey procedure section in this manual for accuracy standards/tolerances.			Not Applicable	GPS: Fast Static Kinematic RTK TSSS: Radial	GPS: Fast Static Kinematic, RTK (Note 12) TSSS: Trig Single Wire Direct Elevation Rod	Topographic Surveys (Data Points) Supplement Design Data Surveys Construction Surveys (Staked Points) Environmental Surveys GIS Data Surveys Right of Way Flagging	

- Notes
1. The standards, specifications, and procedures included in this Manual are based on Federal Geodetic Control Subcommittee (FGCS) standards and specifications. Except where otherwise noted, the FGCS requirements have been modified to meet Caltrans needs.

2. Refer to other Manual sections for detailed procedural specifications for specific survey methods and types of surveys.

3. “B” Order and First Order surveys are performed to FGCS standards and specifications or other requirements approved by National Geodetic Survey.

4. Distance accuracy standard.

5. Closure between established control; e = maximum misclosure in mm, E = distance in km.

6. Survey setup points used for radial stake out.

7. For example a static GPS may be used to establish NAV88 at the project site from a distant NAVD National Spatial Reference System Control.

8. As required by the local survey needs.

9. Instead of including a point as a network point, certain survey points may be positioned by observations from two or more control points (i.e., double tied). If survey points are not included in a network, double ties must be performed to ensure that blunders are eliminated and the positions established are within stated accuracy standard. Double tie procedures should be only used when appropriate; possible examples are photo control points, land net and monumentation points, and major structure stake points.

10. The distance accuracy standard for Basic (Corridor) Control – HPGN-D surveys is 1:500,000.

11. Not to include vertical project control or vertical for major structure points.

12. Not to include pavement elevations.

13. Not to include major structures.